

We Claim:

1. A method for coating a metal substrate, comprising the steps of:  
retrieving a metal substrate with a grasping element of an articulative electromechanical device;  
bringing said substrate into contact with a first autodepositing composition for a predetermined period of time forming a first film on a surface of said substrate;  
articulating said substrate either in said first composition, or a combination thereof, after contact with said first composition for a predetermined period of time, with said electromechanical device.
2. A method according to claim 1, wherein said first film has a dry film thickness of 2.5 to 25.4 micrometers.
3. A method according to claim 2, wherein said contact with said first composition is from 1 to 180 seconds.
4. A method according to claim 3, wherein said articulating step is performed while said metal substrate is in contact with said first autodepositing composition and after contact with said first autodepositing composition.
5. A method according to claim 2, further comprising the step of drying said substrate in a drying device after said first autodeposited film has been formed.
6. A method according to claim 1, further comprising the steps of bringing said substrate into contact with a second autodepositing composition for a predetermined period of time to form a second film on said substrate, and articulating said substrate either in said second composition, or after contact with said second composition, or a combination thereof for a predetermined period of time, with said electromechanical device.

7. A method according to claim 6, wherein said second film has a dry film thickness of 2.5 to 25.4 micrometers.

8. A method according to claim 7, wherein said first autodepositing composition is a metal treatment, or an adhesive composition, and wherein said second autodepositing composition is a primer composition or an adhesive overcoat composition.

9. A method according to claim 2, wherein said first composition comprises a) a metal treatment comprising an acid, and a phenolic resin, or b) an adhesive composition comprising a flexibilizer, and an acid.

10. A method according to claim 7, wherein said second composition is a) a primer comprising a phenolic resin and a flexibilizer, or b) an adhesive overcoat composition comprising a flexibilizer, and phenolic resin and a crosslinker.

11. A method according to claim 7, wherein substrate is dried in a drying device after coating with each said first and second compositions, wherein said drying utilizes infra-red radiation, radio frequency energy, convection currents, air currents, heated zones, forced air, induction, or a combination thereof, and wherein said bringing of said substrate into contact comprises immersion.

12. A method according to claim 3, wherein bringing said substrate into contact comprises immersion, and wherein said electromechanical device comprises a microprocessor which operatively controls a robot arm.

13. A method according to claim 12, wherein said immersion ranges from 3 to 60 seconds.

14. A method according to claim 13, wherein said articulation is performed from 20% to 90% of immersion time.

15. A method according to claim 4, wherein said electromechanical device comprises a robot arm, and where said grasping element is a grasping means, pin, hook, hanger, expandable means, compression grip, insertion grip, suction means, magnet, or a combination thereof, wherein said substrate displaces at least 0.25% of a volume of the first autodepositing composition in a tank, and wherein said first composition has a bath turnover of about 1 hour to about 5 days.

16. A method according to claim 11, wherein said electromechanical device comprises a robot arm, and where said grasping element is a grasping means, pin, hook, hanger, expandable means, compression grip, insertion grip, suction means, magnet, or a combination thereof, wherein said substrate displaces at least 0.25% of a volume of the first autodepositing composition in a tank, and wherein said first composition has a bath turnover of about 1 hour to about 5 days.

17. A method according to claim 4, further including the step of cleaning the substrate utilizing a cleaning device, and wherein said cleaning device comprises mechanical cleaning, chemical cleaning, or a combination thereof.

18. A method according to claim 11, further including the step of cleaning the substrate utilizing a cleaning device, and wherein said cleaning device comprises mechanical cleaning, chemical cleaning, or a combination thereof.

19. A method for coating a metal substrate, comprising the steps of: retrieving a metal-based substrate with a grasping element of an electromechanical device;

bringing said substrate into contact with a first autodepositing composition for a predetermined period of time forming a first film on a surface of said substrate;

articulating said substrate either in said first composition, or after contact with said first composition, or a combination thereof for a predetermined period of time, with said electromechanical device;

bringing said substrate into contact with a second autodepositing composition for a predetermined period of time forming a second film on said substrate; and

articulating said substrate either in said second composition, or after contact with said second composition, or a combination thereof for a predetermined period of time, with said electromechanical device.

20. A method according to claim 19, wherein said first and second films individually have a dry film thickness of 2.5 to 25.4 micrometers.

21. A method according to claim 20, wherein said contact with said first and second films compositions individually is from 1 to 180 seconds.

22. A method according to claim 21, wherein said articulating step is performed while said metal substrate is in contact with said first autodepositing composition and after contact with said first autodepositing composition, and wherein said articulating step is performed while said metal substrate is in contact with said second autodepositing composition and after contact with said second autodepositing composition.

23. A method according to claim 20, further comprising the steps of drying said substrate in a drying device after said first autodeposited film has been formed, and drying said substrate in a drying device after said second autodeposited film has been formed.

24. A method according to claim 21, wherein said first autodepositing composition is a metal treatment, or an adhesive composition, and wherein said second autodepositing composition is a primer composition or an adhesive overcoat composition.

25. A method according to claim 21, wherein said first composition comprises a) a metal treatment comprising an acid, and a phenolic resin, or b) an adhesive composition comprising a flexibilizer, and an acid, and wherein said second composition is a) a primer comprising a phenolic resin and a flexibilizer, or b) an adhesive overcoat composition comprising a flexibilizer, and phenolic resin and a crosslinker.

26. A method according to claim 23, wherein said drying utilizes infra-red radiation, radio frequency energy, convection currents, air currents, heated zones, forced air, induction, or a combination thereof, and wherein said bringing of said substrate into contact comprises immersion.

27. A method according to claim 21, wherein bringing said substrate into contact comprises immersion, and wherein said electromechanical device comprises a microprocessor which operatively controls a robot arm.

28. A method according to claim 27, wherein said immersion ranges from 3 to 60 seconds.

29. A method according to claim 28, wherein said articulation is performed from 20% to 90% of immersion time.

30. A method according to claim 21, wherein said electromechanical device comprises a robot arm, and where said grasping element is a grasping means, pin, hook, hanger, expandable means, compression grip, insertion grip, suction means, magnet, or a combination thereof, wherein said substrate displaces at least 0.25% of a volume of the

first autodepositing composition in a tank, and wherein said first composition has a bath turnover of about 1 hour to about 5 days.

31. A method according to claim 25, wherein said electromechanical device comprises a robot arm, and where said grasping element is a grasping means, pin, hook, hanger, expandable means, compression grip, insertion grip, suction means, magnet, or a combination thereof, wherein said substrate displaces at least 0.25% of a volume of the first autodepositing composition in a tank, and wherein said first composition has a bath turnover of about 1 hour to about 5 days.

32. A method according to claim 21, further including the step of cleaning the substrate utilizing a cleaning device, and wherein said cleaning device comprises mechanical cleaning, chemical cleaning, or a combination thereof.

33. A method according to claim 25, further including the step of cleaning the substrate utilizing a cleaning device, and wherein said cleaning device comprises mechanical cleaning, chemical cleaning, or a combination thereof.